Project Descriptions
15-782: Artificial Neural Networks
Dave Touretzky, Spring 2004

Students enrolled in the graduate version of the Artificial Neural Networks course (15-782) are required to do a project in addition to the other assignments. Students taking the undergraduate version (15-496) are not required to do a project, but may elect to do one if they wish, in which case it will be included along with exams and homework when calculating their grade.

Four choices of project are offered, as described below. Each student doing a project will be assigned a mentor, either the instructor (Dave Touretzky) or the TA (Kornel Laskowski), with whom they should meet periodically to discuss their progress.

Important dates:

- March 29: project selections due. Email the instructor with your choice of project. If pursuing a self-designed project, you should have met with the instructor or TA to discuss the design.
- April 12: progress report.
- May 3: projects due. A brief writeup must be included along with the code, describing what was done and the results that were obtained.

Project Choices

1. Simple Recurrent Network

Implement an Elman-style simple recurrent network, and train it on a small context-free grammar. Use principal components analysis to reveal structure in the trained network's hidden unit representations. (Matlab contains built-in routines for PCA.)

2. Dynamic Arm Model

Reproduce the dynamic arm model described in the Jordan and Rumelhart paper, *Forward models: Supervised learning with a distal teacher.* Note that Homework 4 involves reproducing the kinematic model. To reproduce the dynamic model you will need to adopt their technique of creating a second controller to "bootstrap" the neural net controller.

3. Helmholtz Machine

Implement a Helmholtz machine as described in the two papers in the April 8 lecture. Reproduce the vertical and horizontal bars experiment. Create a new experiment of your own design and show how a Helmholtz machine solves it.

4. Ad Lib

Design a project of your own, perhaps related to your current research area. Details must be worked out with the instructor before the project can be approved.